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(54) Return Electrode Plate for Electric Scalpel

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Specification

1. Title of Invention

Return Electrode Plate for Electric Scalpel

2. Claims

(1) A planar return electrode plate for an electric scalpel, comprising: a dielectric layer, a conductor layer, and an insulating layer, laminated in that order from the upper surface toward the lower surface; wherein: said dielectric layer comprises a thermoplastic resin and a dielectric substance, the volume resistivity of which layer is 10^6 to 10^{16} Ω *cm* and the dielectric constant whereof is 10 to 30 (at 750 kHz); said conductor layer comprises an electrically conductive base material exhibiting flexibility, the volume resistivity of which layer is 10^2 to 10^{-3} Ω *cm*; and said insulating layer comprises a thermoplastic resin, natural rubber, or synthetic rubber, the volume resistivity of which layer is 10^{12} to 10^{16} Ω *cm*.

(2) A return electrode plate for an electric scalpel, comprising: a dielectric layer, a conductor layer, and an insulating layer, laminated in that order from the upper surface toward the lower surface; said dielectric layer whereof comprises a thermoplastic resin and a dielectric substance, the volume resistivity of which layer is 10^6 to 10^{16} Ω *cm* and the dielectric constant whereof is 10 to 30 (at 750 kHz); said conductor layer whereof comprises an electrically conductive base material exhibiting flexibility, the volume resistivity of which layer is 10^2 to 10^{-3} Ω *cm*; and said insulating layer whereof comprises a thermoplastic resin, natural rubber, or synthetic rubber, the volume resistivity of which layer is 10^{12} to 10^{16} Ω *cm*; wherein: one or more types of films of fluorine resins, olefin resins, vinyl chloride resins, vinylidene chloride resins, or poly [sic] or polyester resins are pressure bonded to form a protective film on the upper surface of said dielectric layer.

(3) The return electrode plate for an electric scalpel, cited in claim 1 or 2, wherein the thermoplastic resin in the dielectric layer is one type, or one wherein is compositely used two or more types, of vinyl resins, olefin resins, rubber resins, fluorine resins, or silicon resins.

(4) The return electrode plate for an electric scalpel, cited in claim 1 or 2, wherein the dielectric substance in the dielectric layer is one type, or one wherein is compositely used two or more types, of [(a) substance(s) selected from among] barium titanate, lead titanate, or lead zirconate.

(5) The return electrode plate for an electric scalpel, cited in claim 1 or 2, wherein the electrically conductive base material in the conductor layer is a screen-form or thin film-form metal or dielectric plastic or, alternatively, a carbon fiber woven fabric.

(6) The return electrode plate for an electric scalpel, cited in claim 1 or 2, wherein the thermoplastic resin in the insulating layer is one type, or one wherein is compositely used two or more types, of [(a) resin(s) selected from among] vinyl resins, olefin resins, rubber resins, or urethane resins.

3. Detailed Description of Invention

This invention relates to an electric scalpel return electrode plate which exhibits abundant softness and flexibility, being formed by the use mainly of a thermoplastic resin material. More particularly, the invention relates to an electric scalpel return electrode plate wherein are provided inductive layers and insulating layers, consisting mainly of thermoplastic resin, on the two surfaces thereof, with a conductor layer interposed therebetween.

Conventionally, for this type of electric scalpel return electrode plate, a conductor such as an aluminum plate or stainless steel plate has been used, either as is or after being subjected to a coating treatment.

Accordingly, in conducting electric scalpel surgery on the human body, the human body is brought into direct contact with a sturdy metal plate of comparatively small size which configures a return electrode plate. When that is done, there is a danger in that situations frequently arise, due to the attitude of the equipment or the like, wherein only a portion of the human body makes contact, whereupon electric current concentrates in that portion, causing the human body to suffer burns.

In order to eliminate this shortcoming, a return electrode plate has been proposed wherein an electrically conductive base is formed of electrically conductive fiber, on the surface of which plate is deployed an electrically conductive adhesive layer consisting of a mixture of carbon fiber and resin (Laid-Open Patent Application [TOKKAI] No. S53-123591/1978, gazette). With this, however, electrical characteristics and safety are insufficient. When this return electrode plate is used, moreover, there is an unpleasant sensation because it is brought directly into contact with the human body. Hence the appearance of an outstanding electric scalpel return electrode plate has continued to be hoped for.

An object of the present invention, which was devised with such circumstances in view, is to provide an electric scalpel return electrode plate which exhibits outstanding electrical characteristics and safety, and is also economical.

The present invention relates to a laminated structure comprising a dielectric layer, conductor layer, and insulating layer, and to having a protective film on the upper surface of that laminated structure. More particularly, the present invention provides a return electrode plate for an electric scalpel, wherein, in terms of the optimum conditions in each layer which are made mandatory conditions, the dielectric layer comprises a thermoplastic resin and a dielectric substance, the volume resistivity of which layer is 10^6 to 10^{16} Ω *cm* and the dielectric constant whereof is 10 to 30 (at 750 kHz), the conductor layer comprises an electrically conductive base material exhibiting flexibility, the volume resistivity of which layer is 10^2 to 10^{-3} Ω *cm*, and the insulating layer comprises a thermoplastic resin, natural rubber, or synthetic rubber, the volume resistivity of which layer is 10^{12} to 10^{16} Ω *cm*.

Preferred embodiments of the layers configuring the return electrode plate relating to the present invention are now described. Firstly, the thermoplastic resin used in the dielectric layer may be any such resin so long as it exhibits softness when being molded, but, in view of their electrical characteristics, strength, durability, and economy and the like, vinyl resins, olefin resins, rubber resins, fluorine resins, and silicon resins and the like should preferably be used.

For the dielectric substance used for mixing into these thermoplastic resins, moreover, in general, any which are in fine powder form and exhibit high dielectric properties may be used, but, among such, barium titanate, lead titanate, or dielectric substances known by the general formula ABO_3 are ideal. Ordinarily, 60 to 400 parts by weight of these dielectric substances are used for 100 parts by weight of the thermoplastic resins noted above. That is because, when the mixing ratio is such, the desired volume resistivity of 10^6 to 10^{16} Ω *cm* and the desired dielectric constant of 10 to 30 (at 750 kHz) can be obtained.

Next, for the dielectric base material in the conductor layer, a screen-form or thin film-form metal or dielectric plastic or, alternatively, a carbon fiber woven fabric or the like is preferable. For the metal, one such as brass, nickel, copper, stainless steel, aluminum, gold, or silver is used, and for the dielectric plastic, a thermoplastic resin having dielectric carbon mixed in, that is, a vinyl resin, olefin resin, rubber resin, fluorine

resin, or silicon resin or the like is used. However, a polyolefin or fluorine resin is particularly to be preferred.

For the thermoplastic resin in the insulating [layer], moreover, thermoplastic resins like those pertaining to the dielectric layer are used, but urethane resins are also ideal. Low foams of these resins exhibit a cushioning property and are preferable for use.

The structure of the present invention is now described with reference to the drawings.

Fig. 1 is a diagonal cross-sectional view of one example of the return electrode plate relating to the present invention. The symbols 11, 12, 13, and 14 denote a dielectric layer, conductor layer, insulating layer, and protective film, respectively. The dielectric layer 11 is a sheet-form member molded from a mixture of a thermoplastic resin and a dielectric substance, the thickness whereof should be 0.2 to 0.6 *mm*.

The conductor layer 12 is interposed between the dielectric layer 11 and the insulating layer 13, the thickness whereof is to be within a range that will guarantee flexibility but should ordinarily be 0.2 to 0.5 *mm* or so.

The insulating layer 13 ordinarily has a thickness of 0.5 to 1 *mm*. The protective film 14, moreover, is bonded under pressure to the upper surface of the dielectric layer 11 by some means such as adhesion or fusion, with a fluorine resin film of 10 to 30 μ in thickness excelling in chemical resistance and therefore to be preferred.

The return electrode plate relating to the present invention, formed by the lamination of these layers, may be molded to any size according to the surgical objective. More particularly, in cases where it is necessary during surgery to use the return electrode plate on the entire surface of a human body, it will be molded to match the size of the bed. For use in localized surgery, the return electrode plate may be molded in some suitably smaller size.

Fig. 2 is an explanatory drawing showing how the return electrode plate relating to the present invention is used. Symbol 21 designates a high-frequency generator which is the main electric scalpel unit, symbol 22 designates a human body, symbol 23 designates the return electrode plate relating to the present invention, symbol 24 designates the active electrode (scalpel tip), and symbol 25 designates a power supply.

A return electrode plate based on such a configuration affords outstanding benefits such as those noted below.

a. The comparatively soft thermoplastic resin constitutes the main body, wherefore even large return electrode plates can be easily realized. When a large return electrode plate is used, all that need be done is to spread it on the operating table and have the patient lie down [thereon], and handling is simple because it is only necessary to connect the high-frequency generator to an electrode terminal. Furthermore, because abundant softness is exhibited, the area of contact with the human body during use becomes large due to the weight of the human body, and there is no danger of burns because electric current will not be locally concentrated as with conventional products. In particular, because the surface contacting the human body is either the dielectric layer made of resin or the protective film pressure-bonded on that layer, there is no unpleasant sensation as there is with conventional products comprising a metal. Furthermore, because the conductor layer is sandwiched between the dielectric layer and the insulating layer, there are absolutely no electrical shocks and extremely good safety is realized.

b. With conventional return electrode plates comprising a metal plate, such operations as applying an electrically conductive cream to enhance contact with the human body, or wetting with a physiological saline solution have been necessary, but the present invention does not require any such operation, and such auxiliary materials as creams or saline or the like need not be used. There is also no need for any operation such as securing [the return electrode plate] with a sticky adhesive, whereupon there is no danger of a rash or the like being produced on the human body due to such sticky adhesive.

c. Because the return electrode plate is a condenser type having the conductor layer enclosed between the dielectric layer and the insulating layer, leakage currents from various other electrical instruments or measuring devices in the operating room are completely shielded, and there is no danger of burns to the human body due to other power sources concurrently used.

d. Because the surface is covered with a thermoplastic resin or the like, resistance to water and chemicals is good and, if the protective film is integrally mounted to the return electrode plate, these features are further enhanced and outstanding benefits are exhibited.

e. Because the dielectric layer contains a dielectric substance and is a dielectric which exhibits a high dielectric constant of something like 10 to 30 at 750 kHz, the high-frequency current will flow readily between the blade tip of the electric scalpel and the conductor layer, and an electric scalpel function is realized.

f. The optimum ranges for the volume resistivity of the dielectric layer, conductor layer, and insulating layer, based on the results of practical tests, are established at 10^6 to 10^{16}, 10^2 to 10^{-3}, and 10^{12} to 10^{18}, respectively. Thereby, the electrical characteristics of the present invention are made outstanding.

Next, fabrication embodiment examples of the return electrode plate relating to the present invention are described. In these embodiment examples, parts and percentages (%) are all parts by weight or maximum volume percentages (%).

Embodiment Example 1:

100 parts of a polyvinyl chloride resin, 60 parts of barium titanate, and, as a plasticizer, 20 parts of dioctyl phthalate were mixed together, uniformly kneaded with a mixing roll, and formed into pellets of a mixed substance. This was rolled out with a hot roll to make sheet for the dielectric layer exhibiting a dielectric constant of 20 (at 750 kHz) and volume resistivity of 10^8 Ω *cm*.

Next, a uniform mixture of 100 parts of a polyvinyl chloride resin and 50 parts of dioctyl phthalate was rolled with a calender roll to make sheet for the insulating layer having a thickness of 1000 μ and volume resistivity of 10^{10} Ω *cm*. Between these two sheets, 120-mesh brass metal screen was sandwiched to form the conductor layer, rolled with a hot press, and cooled to yield an integrally molded return electrode plate (450 *m/m* in width, 1000 *m/m* in length).

Embodiment Example 2:

A blend containing 20 parts polyurethane rubber and 80 parts barium titanate was kneaded with a kneader and mixing roll until uniform, then fashioned into pellets, and rolled with a hot roll to make sheet having a thickness of 300 μ. Then a polyvinyl fluoride film having a thickness of 25 μ was hot pressure-bonded onto that sheet to make sheet for the dielectric layer having a protective film, a dielectric constant of 11 (at 750 kHz), and volume resistivity of 10^{14} Ω *cm* (value measured with 500 V applied).

Next, a mixture of 100 parts of a polyvinyl chloride resin and 50 parts of dioctyl phthalate was run through a calender roll, yielding sheet for the insulating layer having a thickness of 1000 μ. The volume resistivity of this sheet was 10^{14} Ω *cm*.

Between these two sheets, a 40-mesh screen made of brass was sandwiched to form the conductor layer, rolled with a hot press, and cooled to yield an integrally molded return electrode plate (450 *m/m* in width, 1000 *m/m* in length).

Electrodes were attached to the conductor layers of the return electrode plates obtained in Embodiment Examples 1 and 2, lead wires were run therefrom and connected to the main electric scalpel unit, and the electric scalpel was used. Favorable results were obtained in both cases.

In the case of Embodiment Example 2 having the protective film, moreover, no loss whatever was observed in dielectric constant due to that protective film, and markedly superior chemical resistance was demonstrated.

4. Brief Description of Drawings

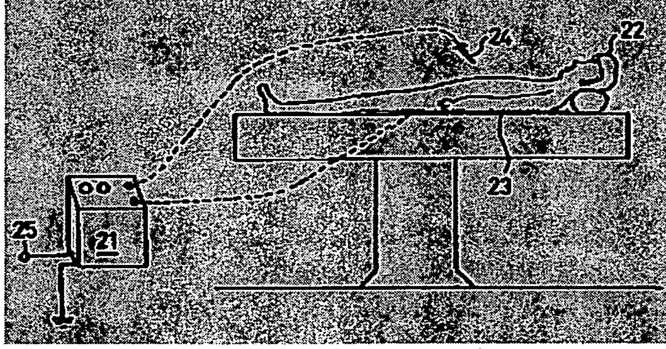
Fig. 1 is a diagonal cross-sectional view of one example of a return electrode plate relating to the present invention, and Fig. 2 is an explanatory drawing representing how the return electrode plate relating to the present invention is used.

11 ··· dielectric layer, 12 ··· conductor layer, 13 ··· insulating layer,

14 ··· protective film.

Figure 1

Figure 2



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㉔電気メス用対極板

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明　細　書

1. 発明の名称

電気メス用対極板

2. 特許請求の範囲

(1)上面から下面に向って、誘電層、導体層、絶縁層の順に積層してなる面状の電気メス用対極板において、上記誘導層が熱可塑性樹脂と誘導性物質とからなり該層の体積抵抗率が10^6～10^{16}Ωcmで誘導率が10～30（於750kHz）であり、また、上記導体層が可撓性を有する導電性基材からなり該層の体積抵抗率が10^2～10^{-5}Ωcmであり、さらに、上記絶縁層が、熱可塑性樹脂、天然ゴム又は合成ゴムからなり該層の体積抵抗率が10^{12}～10^{16}Ωcmであることを特徴とする電気メス用対極板。

(2)　上面から下面に向って誘電層、導体層、絶縁層の順に積層してなり、上記誘電層が熱可塑性樹脂と誘電性物質とからなり該層の体積抵抗率が10^6～10^{16}Ωcmで誘導率が10～30（於750kHz）であり、また上記導体層が可撓性を有する導電性基材からなり該層の体積抵抗率が10^2～10^{-5}Ωcmであり、さらに上記絶縁層が熱可塑性樹脂、天然ゴム又は合成ゴムからなり該層の体積抵抗率が10^{12}～10^{16}Ωcmである電気メス用対極板であって、上記誘導層の上面にフッ素系樹脂、オレフィン系樹脂、塩化ビニル系樹脂、塩化ビニリデン系樹脂、ポリ又はポリエステル系樹脂のフィルムの一種又は二種以上を圧着し保護膜に形成せしめることを特徴とする電気メス用対極板。

(3)　誘電層における熱可塑性樹脂がビニル系樹脂、オレフィン系樹脂、ゴム系樹脂、フッ素系樹脂又はシリコン系樹脂のいずれか一種又は二種以上を混用したものである特許請求の範囲第1項又は第2項記載の電気メス用対極板。

(4)　誘電層における誘電物質がチタン酸バリウム、チタン酸鉛又はジルコン酸鉛のいずれか一種又は二種以上を混用したものである特許請求の範囲第1項又は第2項記載の電気メス用対極板。

(5)　導体層における導電性基材が網状又は薄膜状の金属又は導電性プラスチック成いはカーボン

繊維編織物のいずれかである特許請求の範囲第1項又は第2項記載の電気メス用対極板。

(6) 絶縁層における熱可塑性樹脂がビニル系樹脂、オレフィン系樹脂、ゴム系樹脂又はウレタン系樹脂のいずれか一種又は二種以上を混用したものである特許請求の範囲第1項又は第2項記載の電気メス用対極板。

3.発明の詳細な説明

本発明は主として熱可塑性樹脂材料を使用して形成される柔軟かつ可撓性に富む電気メス用対極板に関する。さらに詳しくは、中間に導体層を介在せしめその両面に主として熱可塑性樹脂からなる誘導層及び絶縁層を設けてなる電気メス用対極板に関する。

従来この種の電気メス用対極板は、アルミ板、ステンレス板等の導体をそのまま又は塗膜加工されたものが使用されている。

従って、人体に対する電気メス手術に当っては、対極板を構成する堅剛な比較的小型の金属板に人体を直接接触させるが、この場合載置の姿勢等に

(3)

より人体の一部しか接触しないことが屡々起り、この一部に電流が集中し、人体に火傷を負わしめる危険性があった。

この欠点を除去すべく、導電性繊維をもって導電性基体を形成し、該基体の表面にカーボンファイバーと樹脂とを混合してなる導電性接着剤層を設けてなる対極板が提案(特開昭53-123591号公報)されているが、その電気的特性及び安全性が不十分であり、また、該対極板が使用される場合直接人体に触接せしめられることによる不快感があって、さらに優れた電気メス用対極板の出現が要望されていた。

本発明はかかる実情に鑑みてなされたものであって、電気特性及び安全性が共に優れ、かつ、経済性を具有した電気メス用対極板を提供することを目的とするものである。

本発明は、誘電層、導体層及び絶縁層からなる積層物及び該積層物の上面に保護膜を有するに関し、特に各層の最適条件を必須要件として、誘電層は熱可塑性樹脂と誘電性物質とからなり、該層

(4)

の体積抵抗率が10^{6}～10^{16} Ωcm、誘電率が10～30(於750 kHz)であり、また、導体層が可撓性を有する導電性基材からなり該層の体積抵抗率が10^{2}～10^{-5} Ωcmであり、さらに、絶縁層は熱可塑性樹脂、天然ゴム又は合成ゴムからなり該層の体積抵抗率が10^{12}～10^{16} Ωcmであることを特徴とする電気メス用対極板を提供している。

本発明に係る対極板を構成する各層における好ましい実施態様は下記のとおりである。まず、誘電層に用いられる熱可塑性樹脂は成形加工の際柔軟性を有するものであれば使用可能であるが、このうち、ビニル系樹脂、オレフィン系樹脂、ゴム系樹脂、フッ素系樹脂、シリコン系樹脂等が電気的特性、強度、耐久性、経済性等からして好ましく使用される。

また、これらの熱可塑性樹脂に混練して用いられる誘電性物質は、一般に微粉状でかつ高誘電性を有するものであればよいが、就中チタン酸バリウム、チタン酸鉛又は一般にABO_3形で知られる誘電性物質が好適である。これらの誘電性物質は通

(5)

常上記熱可塑性樹脂100重量部に対し60～400重量が使用される。これは、かかる配合比の場合に、所望の体積抵抗率10^{6}～10^{16} Ωcm、誘電率10～30(於750 kHz)が得られるからである。

次に、導体層における導電性基材には網状又は薄膜状の金属又は導電性プラスチック或いはカーボン繊維編織物等が好ましい。金属には、真鍮、ニッケル、銅、ステンレス、アルミニウム、金、銀等が使用され、また、導電性プラスチックとして、導電性カーボンを混練した熱可塑性樹脂、即ちビニル系樹脂、オレフィン系樹脂、ゴム系樹脂、フッ素系樹脂又はシリコーン樹脂等が使用されるが、特に、ポリオレフィン系又はフッ素樹脂が好ましい。

さらに、絶縁性における熱可塑性樹脂は概ね誘電層に係る熱可塑性樹脂と同様のものが使用されるが、その他かウレタン系樹脂も好適である。これらの樹脂の低発泡体はクッション性がよく好ましく使用される。

次に、図面を参照して本発明品の構造について

(6)

説明する。

第1図は、本発明に係る対極板の一例を示す斜視断面図である。符号11，12，13，14は夫々誘電層、導体層、絶縁層、保護膜を示す。誘電層11は、熱可塑性樹脂と誘電性物質を混練成型したシート状物で層の厚さは0.2～0.6㎜がよい。

導体層12は、誘電層11と絶縁層13との間に介在せしめられて、その厚さは可撓性を確保しうる範囲内であって、通常0.2～0.5㎜程度のものがよい。

また、絶縁層13は、通常0.5～1㎜の厚さを有する。さらに、保護膜14は、誘電層11の上面に接着、融着等の手段で圧着せしめられるもので、厚さ10～30μでフッ素樹脂フイルムが耐薬品性が優れているため好ましい。

これらの各層を積層してなる本発明に係る対極板は、手術目的により任意のサイズに成型される。即ち、手術時人体全面に適用する必要があるときは、ベットのサイズに合わせて成型され、また、

患部手術用には適宜小型に成型されてよい。

第2図は、本発明に係る対極板の使用状態を示す説明図である。符号21は電気メス本体である高周波発生装置、同22は人体、同23は本発明に係る対極板、同24は能動電極(メス先)、同25は電源を夫々示す。

以上の如き構成に基づく対極板は下記の如き顕著な効果を奏する。

a. 比較的柔軟な熱可塑性樹脂が主体となっているので、大型の対極板であっても容易に得られる。大型のものを使用すると、手術台上に拡げて身体を横たえるだけでよく、また、取扱いも高周波発生装置の電極端子に継ぎ込むだけでよいので簡単である。さらに、柔軟性に富むので、使用時人体の自重により人体の接触面積が大となり、従来品の如く局部的に電流が集中することがなく火傷のおそれがない。特に人体の接触面は樹脂製の誘電層又は該層上に圧着されてなる保護膜であるので、金属からなる従来品の如き不快感がなく、また、導体層が誘電層と絶縁

層との間にサンドウィッチされているので感電することと等全くなく極めて安全である。

b. 従来の金属板からなる対極板では、人体との接触をよくするため導電性クリームを塗布したり、又は、生理食塩水で湿らせる等の作業が必要であったが、本発明品にはかかる作業を必要とせず、クリーム、食塩水等の副資材を使用しなくてよい。また、粘着剤で固定する等の操作も不要であり、該粘着剤による人体のかぶれ等発生するおそれがない。

c. 導体層を誘電層と絶縁層との間に包み込んだコンデンサー型の対極板であるため手術室における その他の種々の電気機器又は計測器類からの漏れ電流を完全に遮断し、人体には併用する他の電源による火傷のおそれがない。

d. 表面が熱可塑性樹脂等で覆われているので、耐水性、耐薬品性等が良好であるが更に、保護膜を一体的に装着した対極板の場合には、一層これらの特性が強化されて優れた効果を示す。

e. 誘電層は誘導性物質を含み誘電率が750kHz

で10～30の如き高誘電体としているため、電気メスの刃先と導体層との間に容易に高周波電流が流れることとなり電気メス機能が達せられる。

f. 実用試験の結果に基づき誘電層、導体層及び絶縁層の夫々の体積抵抗率の最適の範囲を10^{6}～10^{16}，10^{2}～10^{-5}及び10^{12}～10^{18}と定めたことにより本発明品はその電気的特性が優れたものとなる。

次に、本発明に係る対極板の製造実施例を説明する。実施例中に記載の部又は%はいずれも重量部又は重量%を示す。

実施例1：

ポリ塩化ビニル樹脂100部、チタン酸バリウム60部に可塑剤としてジオクチフタレート20部を混合し、ミキシングロールで均一に混練しペレット状の混合物を作製した。これを熱ロールで圧延し、厚さ300μ、誘電率20(於750kHz)、体積抵抗率10^{8}Ω㎝の誘電層用シートを作製した。

次に、ポリ塩化ビニル樹脂100部、ジオクチ

ルフタレート５０部を均一に混合したものをカレンダーロールで圧延し1000μの厚さの体積抵抗率１$0^{10}$Ωcmの絶縁層用シートを作成した。これらの両シートの間に、導体層として１２０メッシュ真鍮製金網を挟みこみ、熱プレス機で圧着、冷却後一体成型された対極板（巾４５０%、長さ1000%）が得られた。

実施例２：

ポリウレタンゴム２０部とチタン酸バリウム８０部とからなる配合物をニーダ及びミキシングロールで均一になるように混練後ペレット状としたものを熱ロールで圧延し厚さ３００μのシートを作製した。さらに、このシートに厚さ２５μのポリビニルフルオライドフイルムを重ね熱圧着し、保護膜を有する誘導率１１（於７５０kHz）、体積抵抗率１$0^{14}$Ωcm（５００Ｖ印加測定値）の誘電層用シートを作製した。

次に、ポリ塩化ビニル樹脂１００部、ジオクチルフタレート５０部の混合物をカレンダーロールにかけ、厚さ1000μの絶縁層用シートを得た。

(11)

このものの体積抵抗率は１$0^{14}$Ωcmであった。

これらの両シートの間に、導体層となる真鍮製の４０メッシュ網を挟み熱プレス機で圧着して冷却後一体された対極板（巾４５０%、長さ1000%）が得られた。

実施例１，２で得られた夫々の対極板の導体層に電極を取付け、取出したコード線を電気メス本体に接続して電気メスを使用したがいずれも良好な結果が得られた。

なお、保護膜を有する実施例２の場合、該保護膜による誘電率の損失は全く見られず、耐薬品性が顕著に優れていることが判明した。

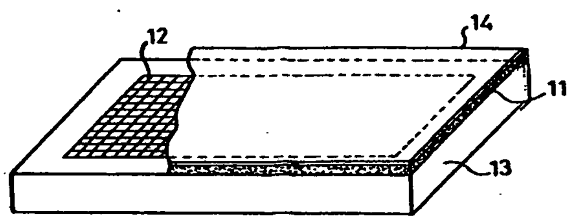
4.図面の簡単な説明

第１図は本発明に係る対極板の一例を示す斜視断面図、第２図は本発明に係る対極板の使用状態を示す説明図である。

１１…誘電層、１２…導体層、１３…絶縁層、１４…保護膜。

(12)

第１図



第２図